

CONCEALED HOUSING LATCH ASSEMBLY FOR PORTABLE ELECTRONIC DEVICE

TECHNICAL FIELD

5 This invention relates in general to housings for portable electronic devices, and more particularly to latch assemblies used to semi-permanently close such housings.

BACKGROUND

10 Portable electronic devices are used for a wide variety of applications from personal digital assistants to cellular telephones and many other functions. Typically such devices house electronics and other components in a plastic housing which is made at least two housing portions. The housing portions can be joined together by a variety of means such as with fasteners like screws, integrally formed snap features,
15 adhesives, and so on. Sometimes housings are designed to be opened by a user, such as to change a battery, for example, and some devices are sealed. Yet other devices are meant to be opened only by service technicians to make repairs and replacements to the device.

 One of the simplest means for making a housing that can be opened and
20 reassembled by a user or for service is with the use of a fastener such as a screw. However, in high volume manufacturing, the use of fasteners such as screws is sought to be avoided. In general there is a preference for the use of integrally formed cantilevered snaps or latches. These type of features are used for a variety of removable housing members, such as battery covers, for example. Latch or snap
25 features can also be used to more permanently join major housing members together

by disposing the features inside the housing. However, when the latch or snap features are located inside, it is not possible to take the housing apart to service the device without damaging the housing. The latch or snap features could be designed to be accessible from the outside, but doing so would allow users to tamper with the components inside the device, leaving manufacturers no way of knowing if a failure is caused by tampering or by a defect that may be covered by a warranty. Furthermore, tampering with devices that transmit radio frequency signals may cause the device to exceed permitted radiation specification, making the device an illegal radiator. Therefore there is a need by which housing members may be semi-permanently joined together that facilitates easy disassembly, but that resists tampering.

BRIEF DESCRIPTION OF THE DRAWINGS

The features of the present invention, which are believed to be novel, are set forth with particularity in the appended claims. The invention, together with further objects and advantages thereof, may best be understood by reference to the following description, taken in conjunction with the accompanying drawings, in the several figures of which like reference numerals identify like elements, and in which:

FIG. 1 is an exploded isometric view of a portable electronic device, in accordance with one embodiment the invention;

FIG. 2 is an exploded perspective view of housing portions for a portable electronic device, in accordance with one embodiment of the invention;

FIG. 3 is an exploded perspective view of housing portions for a portable electronic device, in accordance with one embodiment of the invention;

FIG. 4 is a cross sectional view of a latch assembly, in accordance with one embodiment of the invention;

FIG 5 is a cross sectional view of a latch assembly, in accordance with one embodiment of the invention;

FIG. 6 is a perspective view of a latch release member, in accordance with one embodiment of the invention;

5 FIG. 7 is a cross sectional view of a latch release member, in accordance with one embodiment of the invention;

FIG. 8 is an isometric view of a housing portion for a portable electronic device, in accordance with one embodiment of the invention; and

10 FIG. 9 is a cross sectional view of water seal which is secured by a latch assembly, in accordance with one embodiment of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

While the specification concludes with claims defining the features of the invention that are regarded as novel, it is believed that the invention will be better
15 understood from a consideration of the following description in conjunction with the drawing figures, in which like reference numerals are carried forward.

The invention provides a means for semi-permanently joining major housing members of a portable electronic device in a way that makes disassembly easy for servicing the device, without destruction of the housing members, but that resists
20 tampering. The invention provides internally disposed latch features that can be released by an external means that is concealed. By concealing the latch release features, consumer users will not be aware of their presence, yet service providers will be able to easily service the device. The latch is concealed by a compliant covering through which the latch release may be actuated. Furthermore, the compliant covering

provides an integral water seal between the housing members to resist fluid intrusion into the device, in one embodiment of the invention.

Referring now to FIG. 1, there is shown an exploded isometric view 100 of a portable electronic device, in accordance with one embodiment the invention. The device comprises a first housing member 102, and a second housing member 104 for housing electrical and electronic components 106 between the housing members. The housing members 102, 104 may be, for example the rear and front housings, respectively, of a mobile communication device. A compliant covering 108 covers the second housing member 104. The compliant covering is preferably a rubber material, and provides a measure of vibration and shock protection to “ruggedize” the device.

A catch member 110 is disposed on the first housing member 102, and extends away from a rear surface 111 of the first housing member. The catch member extends beyond an edge 113 of the first housing member so that it can engage with corresponding features in the second housing member 104. The catch member is cantilevered, and deflectable, and has a catch opening 112 formed therethrough at a point between the edge 113 and a distal portion 115 of the catch member. At least one catch member is needed to latch the first and second housing members together, but in alternative embodiments more than one catch member may be used.

A release window 117 is formed at an opening in the side 116 of the second housing member 104. Once the first and second housing members are latched together, the distal portion 115 of the catch member 110 will be aligned with the release window 117. In one embodiment of the invention a latch release member 114 is disposed in the release window. The latch release member is a cantilevered beam that bear against the distal portion of the catch member when actuated, so as to deflect

the catch member and facilitate unlatching the housing members from each other.

The release window, and latch release member, if present, are concealed by the compliant covering 108. In the preferred embodiment, the compliant covering is over-molded onto the second housing member when the second housing member is
5 fabricated. It is contemplated that the compliant covering may cover only a portion of the second housing, or the entire outer surfaces of the second housing member.

Referring now to FIG. 2, there is shown an exploded perspective view 200 of housing portions for a portable electronic device, in accordance with one embodiment of the invention. Here one embodiment of a latch assembly is shown where only one
10 catch member 110 is used. To hold the first and second housing members together while using only one catch member, at least one hook member 202 is disposed on one housing member to engage and hook a hook retaining window 204 in the other housing member. Once the hook or hooks are engaged, the housing members are rotated about an axis defined by the hook engagement, and the catch member latches
15 onto a catch feature (shown in subsequent drawings) disposed in the second housing.

Alternatively, as shown in FIG. 3, which shows an exploded perspective view 300 of housing portions for a portable electronic device, in accordance with one embodiment of the invention, more than one catch member 110 may be used. The catch members are disposed on opposing sides of the first housing member. Each
20 catch member 110 engages a catch features 302 disposed in the second housing member. The catch features are located in correspondence with the catch openings 112 on the catch members 110. As the housing members are moved towards each other, the cantilevered catch members are deflected by the distal portions of the catch members moving past the catch features until the catch openings allow the catch

members to capture the catch features in the catch openings, thereby latching the housing members together.

Referring now to FIGs. 4-5, which show a cross sectional view of a latch assembly, in accordance with different embodiments of the invention. Along the bottom of the drawing is the side of the second housing member 104, without the compliant covering. As shown the catch member is engaged and the housing members are latched together. The catch feature 302 disposed on the second housing member 104 is situated in the catch opening 112 of the catch member 110. To latch the housing members together, the catch member is moved in the direction of arrow 406. As a leading edge 400 of the distal portion 115 of the catch member 110 encounters the catch feature, the catch member is deflected in the direction of arrow 408. Upon the distal portion moving past the catch feature 302, the catch member snap back in the direction of arrow 410 due to the cantilevered loading of the catch member. In FIG. 4, the deflection is accomplished by a ramp surface 402 on the catch feature. Alternatively, the leading edge 400 of the catch member may have a ramped surface 404 to deflect the catch member as it moves past the catch feature. Once the catch feature is captured in the catch opening, movement in the opposite direction of arrow 406 is prohibited by interference between the catch feature and the distal portion of the catch member. To release the catch member once it is latched in place, in the preferred embodiment, a latch release member 114 is actuated in the direction of arrow 412 to engage the distal portion of the catch member, and deflect it so that it clears the catch feature, allowing movement in the opposite direction of arrow 406. The latch release resides in a release window 117. Both the release window and latch release member, if present, will be concealed by the compliant covering (not shown). If the latch release member is not used, then a tool may be used to pierce the

compliant covering an engage the distal portion of the catch member. The tool should have a small diameter so that the complaint covering will substantially close when it is withdrawn, leaving little to no indication that the tool had been used.

Referring now to FIGs. 6 and 7, there is shown a perspective view 600 of a
5 latch release member, in accordance with one embodiment of the invention, and a cross sectional view of a latch release member, in accordance with one embodiment of the invention, respectively. The latch release member 114 is a cantilevered member that is used to deflect the catch member (as shown in previous drawings) so that the housing members may be unlatched from each other. In FIG. 6 the particular view
10 shown is from an outside surface 601 of the second housing member. The latch release member resides in a release window 117 which is an opening formed in the side of the second housing at a point where the distal portion of the catch member will reside when the housing members are latched together. It should be noted that the compliant covering is not shown in these drawings and when present would cover the
15 outer surface 601 and the release window 117. The latch release member has, in the preferred embodiment, an actuating head 602 that may be actuated by force in the direction of arrow 700, causing the inside surface 702 of the latch release member to bear against the distal portion of the catch member, causing the catch member to deflect also in the direction of arrow 700. As mentioned hereinabove, the latch
20 release member may not be used, and instead a tool may be used to penetrate the compliant cover and deflect the catch member to facilitate unlatching of the housing members from each other.

Referring now to FIG. 8, there is shown an isometric view 800 of a housing portion for a portable electronic device, in accordance with one embodiment of the
25 invention. In particular this is the second housing member 104, or alternatively a front

housing for a device such as a mobile communication device. Here the compliant covering 108 is shown over the exterior of the housing member. From the inside of the housing member the catch feature 302 can be seen along with the latch release member 114 in the release window 117. However, from the outside, on the opposite side of the housing member where arrow 804 points, the release window and latch release member are covered by the compliant covering, and are thus concealed. To unlatch the housing members, force would be applied at the point where arrow 804 points in the direction of arrow 804. In an alternative embodiment of the invention, the compliant covering provides a secondary purpose of providing a water seal between the housing members, and the latching assembly is used to maintain the integrity of the seal. In that embodiment, the compliant covering forms a sealing rim 802 along the edge of the housing. The ridge mates with a corresponding groove in the first housing, as shown in FIG. 9.

Referring now to FIG. 9, there is shown a cross sectional view 900 of water seal which is secured by a latch assembly, in accordance with one embodiment of the invention. A sealing groove 902 is formed around the mating edge of the first housing member 102. The mating edge 901 of the first housing corresponds with the edge of the second housing. The compliant covering 108 is disposed on the second housing member 104, and forms a sealing ridge 802. The sealing ridge is formed over a tongue 908 formed along the edge of the second housing member. The tip 904 of the sealing ridge comprises a compressible ridge 906. The width of the sealing ridge at the compressible ridge is wider than the width of the sealing groove, so when the sealing ridge is moved into the sealing groove, the compressible ridge is compressed, forming a seal. In the preferred embodiment, the sealing ridge is formed when the compliant cover is over-molded onto the second housing member.

Thus, the invention provides a concealed housing latch assembly for a portable electronic device for latching a first housing member to a second housing member of the portable electronic device. The latch assembly includes at least one catch member disposed on the first housing member which extends away from the rear surface of the first housing member, and furthermore extends beyond an edge of the first housing member. The catch member is cantilevered and deflectable, and has a catch opening formed therethrough. At least one catch feature is formed on an inside surface of the second housing member at a position corresponding with the opening of the catch member captures the catch member when the housing members are latched together.

10 In the preferred embodiment at least one cantilevered latch release member is formed in the second housing member at a position corresponding to the distal portion of the catch members. The latch release members facilitate deflecting the catch member upon actuating the latch release member so that the housing members may be unlatched. A compliant covering is disposed over the second housing member which

15 acts to absorb vibration and shock experienced by the device, and to conceal the housing latch assembly. In a preferred embodiment of the invention the compliant covering forms a water seal between the first and second housing members. The water seal is formed by a sealing groove disposed along the perimeter of a mating edge of the first housing member and a sealing rim having compressible ridge

20 disposed on the second housing member. The sealing rim corresponds to the sealing groove and is wider than the sealing groove at the compressible ridge. When the compressible ridge is compressed upon insertion of the sealing rim into the sealing groove, a seal is formed. In a preferred embodiment, the compliant covering is disposed onto the second housing member by an over-molding process.

In an alternative embodiment, the first housing member comprises at least one hook member on an opposite side of the first housing member from the catch member. The second housing member comprises at least one hook retaining window corresponding to the hook member for retaining the hook member therein upon assembly of the first housing member to the second housing member. Alternatively, two catch members may be used in the first housing member, along with corresponding catch features in the second housing member. To facilitate deflection of the catch member, either the catch feature may be ramped, or a leading edge of the distal portion of the catch member may be ramped.

10 It is contemplated that device may be a mobile communication device, and the invention comprises a housing member of the mobile communication device having the features described herein. In addition, it is contemplated that the features and latch members described herein may be designed so that they appear on the opposite housing member from that described here. One of ordinary skill would recognize
15 such a design change as an equivalent of the particular embodiment described in detail herein.

While the preferred embodiments of the invention have been illustrated and described, it will be clear that the invention is not so limited. Numerous modifications, changes, variations, substitutions and equivalents will occur to those
20 skilled in the art without departing from the spirit and scope of the present invention as defined by the appended claims.

What is claimed is: